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LEVEL II

AIR FORCE HUMAN RESOURCES LABORATORY

TASK ANALYSIS HANDBOOK

By

Philip B. DeVries, Jr.
A. John Eschenbrenner, Jr.
McDonnell Douglas Astronautics Company – St. Louis
P.O. Box 516
St. Louis, Missouri 63166

Hendrick W. Ruck

MANPOWER AND PERSONNEL DIVISION
Brooks Air Force Base, Texas 78235

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Final Report

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

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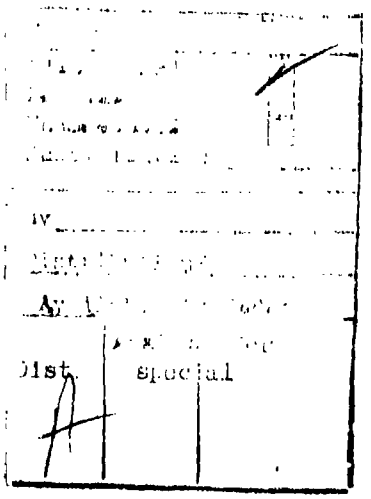
This technical report has been reviewed and is approved for publication.

RAYMOND E. CHRISTAL, Technical Director
Manpower and Personnel Division

RONALD W. TERRY, Colonel, USAF
Commander



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The handbook provides a validated set of procedures and guidelines for analyzing tasks into subtasks and supporting skills and knowledge. The handbook is designed for use in technical training by subject matter experts. It assumes that tasks have already been selected for training, that trainee proficiency levels have been determined, and that the trainee population is known.

There are three major stages of the task analysis procedure contained in the handbook. They are: (a) Development of preliminary performance requirements (PPRs), (b) Identification of subtasks, (c) Identification of supporting skills and knowledge.

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HOW THIS HANDBOOK IS ORGANIZED

The Task Analysis Handbook is divided into four major sections. The first section provides a general introduction to task analysis and an overview of handbook procedures and guidelines. The remaining three sections cover, in detail, the three major stages of the task analysis.

The figures and tables which are to be used with each handbook section are placed immediately following the page of text in which they are first referenced. You should note that the figures and tables for the introduction are prefaced with the letter I (e.g., Figure I-3 is the third figure relevant to the introduction). The tables and figures for the three task analysis stages (A, B and C) are prefaced with the letter designator for each stage (e.g., Table A-6 is the sixth table relevant to Stage A).

INTRODUCTION

PURPOSE AND SCOPE OF THIS HANDBOOK

The primary purpose of this handbook is to provide a set of procedures and guidelines to those individuals assigned responsibility for analyzing any new or altered tasks which have been identified as requiring training.

In this introductory chapter, a brief overview of the Instructional Systems Development (ISD) process is provided. Although you have probably seen descriptions of the ISD process before, this information is provided primarily as a refresher.

Following the brief ISD overview, a definition of task analysis is provided and its place within the overall ISD process is described. Additionally, terms relevant to task analysis are defined and described. Finally, an overview of the task analysis process to be presented in the handbook is given. Later chapters in this handbook present more detail regarding this task analysis process.

The procedures detailed in this Handbook assume that:

(1) Job tasks and associated proficiency levels have already been identified and listed. In most situations, this listing will be in the form of a training standard. Therefore, the described procedures are presented as though a training standard exists. The procedures are also applicable to those relatively few situations where a training standard is <u>not</u> available. However, in these situations it is presumed that there exists a listing of tasks (with at least a tentative indication of required proficiency levels).

(2) The trainee population has been identified.

(3) It has been determined that there is a valid need for training.

(4) There is some reason for analyzing or reanalyzing the listed job tasks (e.g., a change in training policy, a change in training facility, a change in the quality of the students to be trained a change in the subject matter, and/or evaluation feedback or course scrubdown results, which indicate a need to make changes).

(5) You are responsible, or have a share of the responsibility, for insuring that only what is needed will be taught and that it is taught in the most cost-effective way.

INSTRUCTIONAL SYSTEMS DEVELOPMENT (ISD)

Since the U.S. Air Force (AF) developed its first major instructional system in 1965, the systems approach to training has received considerable emphasis within the Department of Defense and the civilian sector. Instructional System Development is a systematic process for designing and developing effective and efficient training. In 1972, the AF Chief of Staff directed that ISD be applied to all training planning.

Instructional Systems Development is a five step process and is diagrammed in Figure I-1. Each of the five steps is briefly described below.

Step 1: ANALYZE SYSTEM REQUIREMENTS - Determine precisely what the job requires in terms of the human role.

Step 2: DEFINE EDUCATION/TRAINING REQUIREMENTS - Determine who is to do the job, and what education or training is necessary to enable an individual to perform satisfactorily.

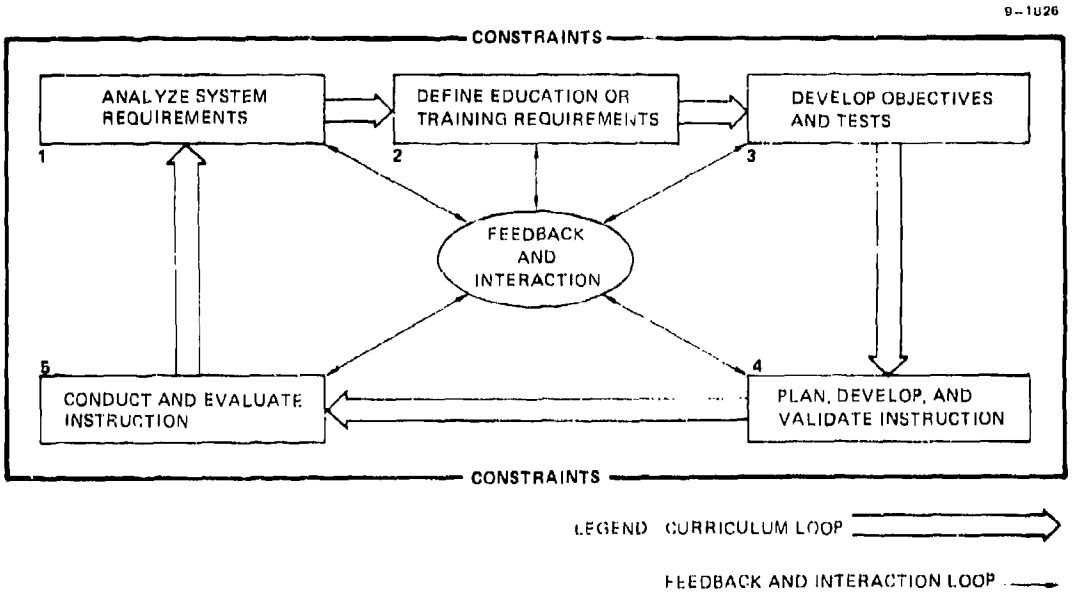

FIGURE I–1 THE ISD MODEL

Step 3: DEVELOP OBJECTIVES AND TESTS - Define these education/training requirements as specific, behaviorally-stated objectives and prepare test items to determine if trainees have attained the objectives.

Step 4: PLAN, DEVELOP AND VALIDATE INSTRUCTION - Design instructional procedures and materials that will develop the skills and knowledges the trainees need to reach the objectives, and validate these procedures and materials to be sure they really do provide the needed instruction -- no more, no less. Whatever portion of the instruction does not equip the trainees to meet the objectives (and ultimately, to do the job) must be redesigned until it works.

Step 5: CONDUCT AND EVALUATE INSTRUCTION - Implement instruction, identify problem areas, and take corrective actions needed to satisfy job performance requirements.

The ISD model illustrated in Figure I-1 prescribes an approach to the planning and development of instruction that is adaptive to all education and training programs. It is applicable to the revision and improvement of ongoing courses as well as to the design of new courses. It is composed of logically sequential and interacting steps, with the output of each step providing the input needed to accomplish later steps. In addition, the outputs of later steps also provide feedback to earlier steps. Since there is this feedback and interaction, it is possible that portions of several steps can be accomplished simultaneously.

Notice that the diagram of the five step ISD model is surrounded by a box labeled "constraints." This term has been introduced into the model because the application of the ISD process may require compromises.

For example, limited funds frequently rule out desirable options when selecting training media. Constraints of this sort must be considered in the design of any instructional system.

TASK ANALYSIS

Although an overview of the entire ISD process has been presented, it should be noted that this handbook deals with only one portion of that process: specifically, task analysis. The term "task analysis," as used in this handbook, is defined as the process of breaking down a task into its component subtasks and then determining precisely what skills and knowledges a trainee needs to acquire in order to accomplish each subtask. As such, it is a fundamental activity in Steps 2 and 3 of the ISD process.

DEFINITIONS OF TERMS AND A LOOK AT THE HIERARCHY OF PERFORMANCES

Some terms are used frequently in this handbook. It is essential that those involved in ISD and task analysis efforts define such terms as job, duty, task, subtask, skill, and knowledge in the same way. It is also important that task analysts know how these terms relate to one another. Figure I-2 illustrates the relationship between the several levels of a job breakdown and each level is briefly defined in Table I-1.

Because this handbook is primarily concerned with the breakdown of a task into its component subtasks and the breakdown of subtasks into supporting skills and knowledges, further explanation of the difference between these three levels of the job hierarchy is necessary.

Tasks

The primary characteristics of a task are:

a. A task is a specific action

b. A task has a definite beginning and end

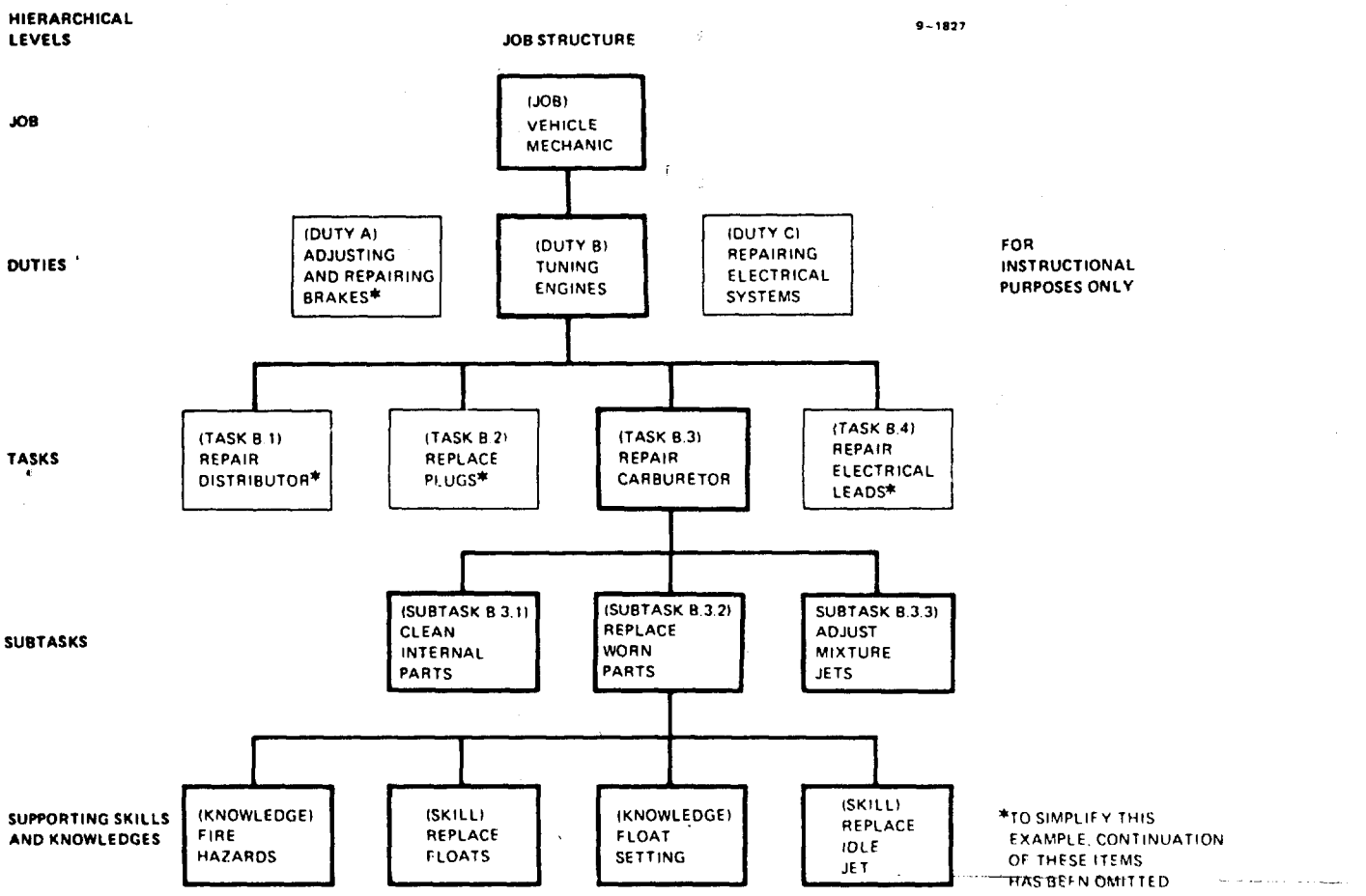

FIGURE I-2 **HIERARCHY OF JOB PERFORMANCE RELATIONSHIPS (JOB OF VEHICLE MECHANIC)**

9–1829

TABLE I–1
HIERARCHY OF PERFORMANCES, TITLES, AND DEFINITIONS

• Job	The duties and tasks performed by the person who fills a position.
• Duty	One of the large segments of closely related tasks performed during a person's job.
• Task	Part of a duty; an action performed for its own sake, a specific action, with verb and object, resulting in a meaningful product or service; an observable and time-rateable action independent of other actions under the duty.
• Subtask	A major step in performing the task; dependant on other subtasks.
• Supporting Skills	Manipulative skills or mental skills which allow consummation of a given action; very small, interdependent activities.
• Supporting Knowledges	Mental conditions or capabilities which enable a person to act intelligently and purposefully.

c. A task is performed for a relatively short period of time [i.e., seconds, minutes, hours, or days (rarely)].
d. A task is observable and measurable; that is, a technically proficient individual can observe the performance of the task or examine a product and be able to determine that the task has been performed properly.
e. Each task is independent of other actions.

Subtasks

A subtask has all of the characteristics of a task except independence. Major differences between a task and subtask are:

a. Each task is independent of other tasks. Each subtask is dependent upon other subtasks. A subtask is relatively meaningless outside of the group of subtasks that make up a task.
b. Tasks are not components of a procedure. Subtasks are always components of a procedure.
c. In the eyes of a person doing a job, a task is performed for its own sake in the job situation. A subtask is never performed for its own sake in the job situation. A subtask is ONE STEP IN THE PERFORMANCE OF A TASK.

There are two primary reasons why a task must be broken down into subtasks. First, without this level of detail, an instructional designer could not prepare meaningful instruction. Second, some task statements look alike although the tasks are actually quite different. As an example, note that in Table I-2, while the task statements are the same, the actual subtasks are quite different across job levels. The subtasks that make up the task give a special meaning to the task at each job level.

9–1830

TABLE 1–2
RELATIONSHIP BETWEEN TASK, JOB LEVEL, AND SUBTASK

TASK	JOB LEVEL	SUBTASKS
Prepare Reports	Very Low	Fill out logs Count units of material Compute indices
Prepare Reports	Intermediate	Combine totals Integrate information Prepare drafts
Prepare Reports	Upper	Check accuracy Finalize format Obtain concurrence
Prepare Reports	Highest	Approve reports Release reports Interpret reports

Supporting Skills

The hierarchy of performances does not end with the subtask. In order to perform the subtasks and eventually accomplish the task, a person must apply certain skills. An individual may require manipulative skills, such as using handtools, and mental skills, such as reading and interpreting technical instructions. These supporting skills constitute yet another division in the hierarchy.

For example, a mechanic replacing an alternator would need to interpret the appropriate technical order (T.O.) to find the proper instructions for the task. The mechanic would also have to select the appropriate wrench and use it to remove the alternator mounting bolts. Interpreting, selecting, and using are examples of supporting skills. In another example, a flight engineer computing fuel consumption would need to analyze atmospheric conditions. The engineer might also have to manipulate a slide rule. The analyzing and manipulating are examples of supporting skills.

Supporting Knowledges

Supporting knowledges can be considered on a parallel plane with supporting skills. A person also must have certain knowledges to perform subtasks. Supporting knowledges might include such things as names of parts, location of parts, and operating principles.

For example, a mechanic replacing an alternator would need to have a mental image of the alternator in order to distinguish it, say, from the battery. It also would be helpful for the mechanic to know the alternator's location among the components of the vehicle's power package. Likewise, the mechanic would need to know the location of the mounting bolts.

OVERVIEW OF THE TASK ANALYSIS PROCESS

Although task analysis, as defined, may sound simple enough, the task analysis process is actually quite complex. Figure I-3 presents, in flowchart format, a detailed outline of the task analysis process to be presented in this handbook. It is a three stage process which is applicable to both the development of new technical training courses and the revision of existing ones. As presented, the process assumes that a comprehensive listing of tasks to be taught is available. For existing courses this listing will be in the form of a Specialty Training Standard (STS) or a Course Training Standard (CTS). The STS or CTS is a "contract" between the Air Training Command (ATC) and the using Command. It specifies what must be taught (and to what level) in each course. For new courses it is possible that neither an STS or CTS exists. If this is the case your starting point might be a task listing which will be similar in format to an STS/CTS.

The three major stages of the task analysis process outlined in Figure I-3 are as follows:

Stage A: DEVELOPMENT OF PRELIMINARY PERFORMANCE REQUIREMENTS (PPRs) - Converting STS/CTS items into PPRs.

Stage B: IDENTIFICATION OF SUBTASKS - Breaking each STS/CTS task down into its component subtasks.

Stage C: IDENTIFICATION OF SUPPORTING SKILLS AND KNOWLEDGES - Determining the skills and knowledges that are necessary to perform each subtask (and ultimately the task). The products of this stage indicate what must actually be taught to the students.

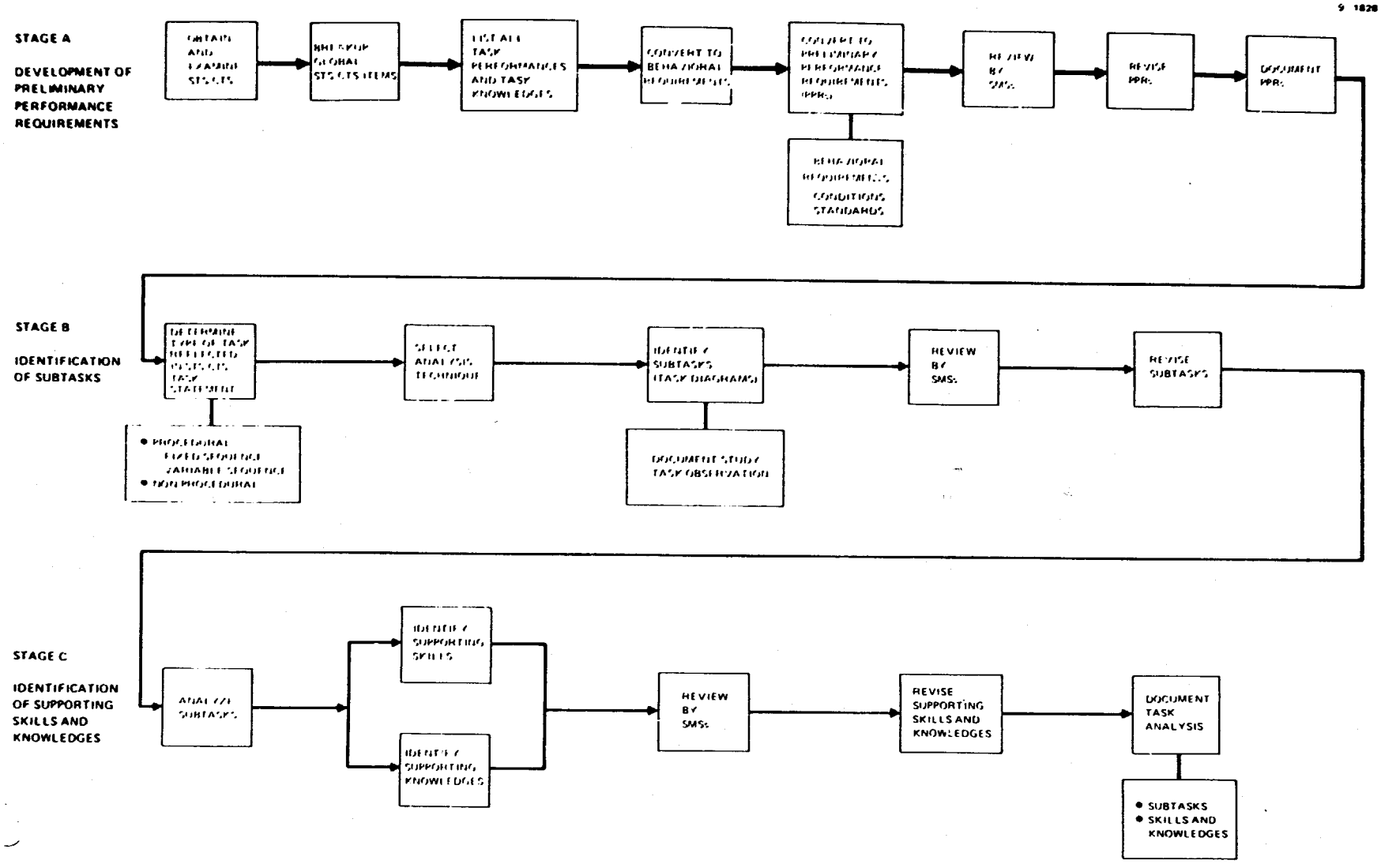

FIGURE I–3 TASK ANALYSIS PROCESS

Each of these stages is described in more detail in the sections that follow.

Stage A: Development of Preliminary Performance Requirements (PPRs)

Examination of Figure I-3 indicates that the task analysis process starts with the examination of the STS or CTS for the course which is to be developed or revised. These standards contain three types of items: (1) task performance items; (2) task knowledge items; and (3) subject knowledge items. The procedures in this handbook will be restricted to analysis of task performance and task knowledge items. Subject knowledge items will not be analyzed because they cover or summarize "supporting knowledges." After all the task performances and task knowledges have been analyzed, common subject knowledges can be identified and labeled to simplify (shorten) standards.

Usually the task performance and task knowledge items from the STS/CTS are singular in nature. That is they encompass only one, distinct task. Unfortunately, some STSs/CTSs are found to contain some items which are more "global" in nature. It is therefore necessary to convene a panel of Subject Matter Specialists (SMSs), identify these global STS/CTS items, and break them down into separate and distinct tasks. Tasks which require that trainees be able to demonstrate hands-on proficiency and tasks which require that trainees give evidence of having acquired the knowledges necessary to support task performance are then listed (preserving the order in which they appear on the STS/CTS). Those items not already in the form of behavioral requirements which are appropriate for training are then converted into such a form. That is, into a precise statement of what trainees must actually do in the course to demonstrate that they: (1) can perform the task or (2) have acquired the knowledges necessary to support on-the-job training (OJT).

Once the behavioral requirements are developed they must be transformed into Preliminary Performance Requirements (PPRs). A PPR consists of (1) the behavioral requirement, (2) a description of the conditions under which the trainee must demonstrate the behavior (in the course) and (3) the standard by which the demonstrated behavior will be evaluated. Once a complete list of PPRs is generated, you need to have SMSs review the PPRs for accuracy. You then revise them as necessary and document them.

Stage B: Identification of Subtasks

The second major stage in the task analysis process is the breakdown of each task into its component subtasks. Subtasks are major steps in performing a task. Subtasks are not generally meaningful by themselves (e.g., disconnect the battery ground cable). Instructional technologists agree that the manner in which subtasks are identified depends somewhat on the nature of the task. A preliminary step in accomplishing subtask identification is to decide what type of task is reflected in the STS/CTS Task Statement. There are two basic types of tasks: (1) tasks that are primarily procedural, in which an order of completion of subtasks is specified; and (2) tasks that are primarily nonprocedural, in which the order of subtask completion is not necessarily specified. Procedural tasks are further subdivided into fixed sequence (linear order of completion) and variable sequence (branching order of completion) tasks. Once the decision has been made regarding the type of task to be analyzed, you need to select and apply an appropriate analysis technique. These analysis techniques will be discussed in more detail in later sections.

A variety of information sources are useful in identifying subtasks These include existing documentation, e.g., field evaluation reports, technical orders (T.O.s), existing training materials, and task observation records.

A task diagram is a drawing of the subtasks and their relationships (sequencing, decision points, etc.). You need to submit the task diagrams to a group of SMSs for an accuracy and completeness review. Based on SMS feedback, you should make appropriate modifications to the task diagrams. These diagrams will then be utilized in Stage C of the analysis.

Stage C: Identification of Supporting Skills and Knowledges

The third major stage in the task analysis process is the identification of skills and knowledges required to support subtask performance. The importance of this step cannot be overemphasized. The products of this stage will indicate what the trainee must actually be taught and, as such, provide important information for curriculum development. This stage of the task analysis ultimately reduces to a series of inferences about the subtasks, taking the target population (nature of the typical student) and PPRs into account. This is the primary reason why review and verification by other SMSs becomes so critical at this stage of the process.

Preliminary documentation of the supporting skills and knowledges will be a continuation of the task diagrams prepared in Stage B. The task analyst extends and enlarges these diagrams by indicating the skills and knowledges one must possess in order to perform each subtask. When the task diagrams have been completed, they are submitted for SMS review and revised as necessary. These task diagrams are then used to formally document the analysis.

The next three chapters cover each of these three stages of task analysis in greater detail. Each chapter contains specific procedures and guidelines for performing task analysis.

OBTAIN AND EXAMINE TRAINING STANDARD (STS OR CTS)

The first step in the task analysis is to obtain the current version of the STS or CTS. The STS includes a complete listing of what must be taught (and to what level) in a course; it is normally used in technical training. The CTS is normally used in flying training, other officer training courses, and airman courses not covered by an STS. Like the STS, the CTS also establishes what must be taught (and to what level) in a formal training course. If the document contains a listing of tasks, knowledges, and levels of proficiency, it is considered a training standard.[1]

A training standard actually contains three types of items: (1) task performance items, (2) task knowledge items and (3) subject knowledge items. A few words of explanation about each type of item follow.

1. Task Performance Items - These are tasks which trainees must be able to perform during their training. For many of these tasks, trainees must physically demonstrate that they can accomplish the task. In some instances, however, the required proficiency level can be attained without actually requiring the trainees to perform the task from start to finish in a single session. That is, task proficiency is demonstrated incrementally, over a number of sessions or even course blocks. Task performance items are easily identified. They are the items coded with a combination of an arabic numeral and a lower-case letter (e.g., 2b, 3c).

[1] The items contained in any training standard are based on previously determined job performance requirements of the using organizations and a trainee population that already has certain skills, knowledges, and attitudes when it enters the course. The levels of proficiency spelled out in any training standard are based on (1) the proficiency level required on the job, (2) some fact of life (constraints) that may set limits on the total time available for instruction, and the facilities and equipment available for instruction, (3) the current training policy/philosophy of the Air Force, and (4) the amount of on-the-job training the using commands agree to provide. The fact that someone in authority feels it necessary to make a course revision suggests the possibility that one or more of these factors has changed and that the training standard may no longer be accurate. The first thing to do is to get the assurance of some responsible person that the training standard you are to work with is accurate. If you cannot get assurance that someone has checked the training standard then you, or someone else, must check it. If you find it is not accurate, you must initiate action to get it corrected. The training standard you start with must be a correct statement of the training requirements. Otherwise you may be making a big course revision effort that is based on incorrect information, and you may end up with a course that includes some skills and knowledges *not* needed on the job, and does *not* include some skills and knowledges that are needed.

2. Task Knowledge Items - Task knowledge items are coded with a lowercase letter (e.g., b) in the proficiency code column of the STS/CTS. These are tasks for which trainees must acquire only the knowledges required to support task performance. During training they will not be expected to actually perform the task. However, they will be expected to demonstrate that they have acquired the knowledges necessary to support OJT. Reasons for including task knowledge items in the training standard include: lack of equipment to support task performance during training, excessive training time requirements, and/or the fact that the skills may be more easily learned on the job.

It is important to note that a task knowledge item is distinguished from a task performance item solely on the basis of the proficiency code associated with it. For example, an item on the STS/CTS which is coded with a "b" for Skill Level 3 but with a "2b" and "3c" for Skill Levels 5 and 7, respectively, is considered as task knowledge item only for Skill Level 3. For Skill Levels 5 and 7 it would be considered a task performance item.

3. Subject Knowledge Items - These types of items are coded with a single upper-case letter (e.g., C). This type of item identifies facts and concepts required for reporting, decision-making and or successful job performance. In reality, these items group supporting knowledges common to the performance of several tasks already contained in the STS/CTS. They provide a way of simplifying and shortening the standard. The present procedures will not address analysis of this type of STS/CTS item. These items are comprised of the supporting knowledges referred to in the introduction and will therefore be identified in Stage C of the analysis of task performance and/or task knowledge STS/CTS items.

All training standards contain the proficiency levels required for each of the three types of items. These proficiency levels indicate the quality, amount, or extent of overt or covert behavior required for each listed item. A standard code key is used for all training standards that describe AF technical training. Table A-1 shows the levels of proficiency, scale values, and definitions. Note that task performance items are denoted by a combination of an arabic numeral and a lower-case letter (e.g., 2b, 3c), task knowledge items by a single lower-case letter (e.g., b, c) and subject knowledge items by a single upper-case letter (e.g., B, C). Table A-2 is an excerpt from an STS and shows examples of the three types of items and the associated proficiency codes. Note that the example of a task knowledge item is only so for Skill Level 3.

BREAKUP GLOBAL STS/CTS ITEMS

Most STS/CTS items are singular in nature. That is, they encompass only one, well defined task. Unfortunately, some STS/CTS items are "global" in nature. They actually encompass more than one task. Examples of singular and global STS items are given below:

Singular Task: Align telegraph multiplex equipment

Global Task: Align, adjust, and tune telegraph multiplex equipment

If global items appear in the STSs/CTSs, you must convene a group of at least two other SMSs. You and the other SMSs first decide which task performance items and which task knowledge items are global. (For previously mentioned reasons you will not be concerned with subject knowledge items.) After identifying the global task performance and task knowledge items, you must then break them up into distinct, singular tasks.

TABLE A–1
STS/CTS PROFICIENCY LEVELS

9–1833

PROFICIENCY CODE KEY		
	SCALE VALUE	DEFINITION: The Individual
TASK PERFORMANCE LEVELS	1	Can do simple parts of the task. Needs to be told or shown how to do most of the task. (EXTREMELY LIMITED)
	2	Can do most parts of the task. Needs help only on hardest parts. May not meet local demands for speed or accuracy. (PARTIALLY PROFICIENT)
	3	Can do all parts of the task. Needs only a spot check of completed work. Meets minimum local demands for speed and accuracy. (COMPETENT)
	4	Can do the complete task quickly and accurately. Can tell or show others how to do the task. (HIGHLY PROFICIENT)
*TASK KNOWLEDGE LEVELS	a	Can name parts, tools, and simple facts about the task. (NOMENCLATURE)
	b	Can determine step by step procedures for doing the task. (PROCEDURES)
	c	Can explain why and when the task must be done and why each step is needed. (OPERATING PRINCIPLES)
	d	Can predict, identify, and resolve problems about the task. (COMPLETE THEORY)
**SUBJECT KNOWLEDGE LEVELS	A	Can identify basic facts and terms about the subject. (FACTS)
	B	Can explain relationship of basic facts and state general principles about the subject. (PRINCIPLES)
	C	Can analyze facts and principles and draw conclusions about the subject. (ANALYSIS)
	D	Can evaluate conditions and make proper decisions about the subject. (EVALUATION)

-- EXPLANATIONS --

* A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task. (Examples: b and 1b)

** A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.

– This mark is used alone instead of a scale value to show that no proficiency training is provided in the course, or that no proficiency is required of this skill level.

X This mark is used alone in course columns to show that training is not given due to limitations in resources.

TABLE A-2
EXCERPTS FROM A SPECIALTY TRAINING STANDARD (STS)

9-1834

STS 27230/50/70

TASKS, KNOWLEDGES AND STUDY REFERENCES	PROFICIENCY LEVEL, PROGRESS RECORD AND CERTIFICATION								
	2 3 Skill Level			3 5 Skill Level			4 7 Skill Level		
	A AFSC/Crs	B Date OJT Started	C Date Completed & Trainers/ Trainee's Initials	A AFSC	B Date OJT Started	C Date Completed & Trainers/ Trainee's Initials	A AFSC/Crs	B Date OJT Started	C Date Completed & Trainers/ Trainee's Initials
4. SUPERVISION AND TRAINING ← DUTY									← STS NUMBER
a. Supervision SR: AFMs 35-1, 30-1, 39-62, 50-20									
(1) Evaluate performance of personnel and complete appropriate rating forms ← STATEMENT NUMBER				2b			4c		
(2) Initiate correspondence and SOPs concerning internal policies and procedures				2b			4c		
10. VFR AIRCRAFT TRAFFIC CONTROL ← STUDY REFERENCE SR: AFM 60-5									
a. Local VFR control area	B			C			C		
b. Use standard VFR traffic control procedures and phraseologies ← PROFICIENCY CODE LEVEL	2b			3c			4c		
c. Features and capabilities of the control tower console ← SUBJECT KNOWLEDGE ITEM	B			C			C		
d. Operate tower back-up communications equipment	1 b/X			3c			4c		
e. Perform routine check of tower equipment ← TASK KNOWLEDGE ITEM	b			3c			4c		
f. Initiate emergency assistance for VFR traffic	2b			3c			4c		
g. Control simulated flame-outs ← TASK PERFORMANCE ITEM	1b			3c			4c		

Although differentiation of the global STS/CTS items is largely a judgmental process, the Occupational Survey (OS) will serve as an aid and, if available, should be used. The OS is an extensive listing of all tasks performed by individuals in a particular career ladder. Unlike some CTSs, which contain global items, the OS has not "compressed" many tasks into one. The OSs that will be of most value are ones keyed to the STS/CTS.

Once global STS/CTS items have been differentiated, you must record these differentiated tasks. Do this by placing a circled number next to the global item on the STS. Then on a separate piece of paper, write down these circled numbers and the corresponding list of differentiated tasks or knowledges. Next to each differentiated task, write the proficiency code of the global STS/CTS item from which it was derived. Finally, attach this set of lists to the STS/CTS.

LIST ALL TASK PERFORMANCES AND TASK KNOWLEDGES

Now that you are familiar with the STS/CTS and have broken up the global items, you need to compile a listing of all STS/CTS task performance items and task knowledge items which require analysis. These items should be listed on the form shown in Figure A-1, preserving the order in which they appear on the STS/CTS. In the first column, you should record the STS/CTS reference and in the second column, the proficiency code of the item. (If the item was derived from a global item, indicate the reference and proficiency code for the global item from which it was derived.) In the third column, record the item as it actually appears in the STS/CTS. (If the item was derived from a global item, then the derived item should be placed in this column.) For the moment you should leave the last column blank.

9–1831

ANALYST:_____ COURSE NO:_____ STS/CTS NO. _____ DATED:_____ PAGE_____ OF_____

STS/CTS REF.	PROF. CODE	STS/CTS TASK STATEMENT	BEHAVIORAL REQUIREMENT

FIGURE A–1 BEHAVIORAL STATEMENT LIST FORM

CONVERT TASK PERFORMANCE AND TASK KNOWLEDGE STATEMENTS TO BEHAVIORAL REQUIREMENTS

The extent of a trainee's ability to perform a task or to demonstrate his/her knowledge regarding a task can only be measured in terms of observable behavior. For this reason all task performance and task knowledge statements in the STS/CTS contain action verbs which communicate measurable, observable performance. While these action verbs are appropriate for actual performance of the task, they are not always appropriate for training purposes. You must therefore convert the task statement, as it appears on the STS/CTS, into a form that is appropriate. Task performance statements, because they require that the trainee actually be able to perform the task upon completion of training, will usually be in correct form. However, the task knowledge statements from the STS/CTS will need to be converted because trainees do not actually need to be able to perform the task during training. They are only expected to acquire supporting knowledges which will enable them to learn to do the task during OJT.

If an STS/CTS task performance or task knowledge statement is not in a form appropriate for training, you must convert it into a form that is. This appropriate form is called a behavioral requirement.

There are two important rules which apply to the specification of any behavioral requirement.

- o Use action verbs which communicate measurable, observable performance
- o Qualify the behavior when necessary.

Use Action Verbs to Communicate Measurable, Observable Performance

You should have little difficulty determining if the action verb is appropriate for task performance statements. Examples of action verbs appropriate for task performance are shown in Table A-3. (For a more complete list of action verbs see Military Specification 38800B.)

TABLE A-3
EXAMPLES OF ACTION VERBS FOR TASK PERFORMANCE ITEMS

Adjust	Manipulate
Administer	Mark
Assemble	Measure
Calibrate	Operate
Check	Place
Collate	Position
Complete	Prepare
Disassemble	Print
Display	Probe
Execute	Process
Fillout	Record
Guide	Remove
Handle	Repair
Initiate	Replace
Inspect	Troubleshoot
Interlock	Use
Interview	Weigh
Load	

Task knowledge statements also require an appropriate action verb. There are two types of task knowledge statements. Those that imply learning information and those that imply acquisition of a mental skill. It may not be precisely clear to you which type a particular STS item is, but a look at the proficiency code should give you an indication. If you refer to the definitions of each code in Table A-1 (p. 24) you will note that "a" and "b" codes generally imply learning information. On the other hand, "c" and "d" codes generally imply learning mental skills. Examples of action verbs for each type of knowledge item are shown in Table A-4.

REMEMBER THAT FOR TASK KNOWLEDGE STATEMENTS YOU DO NOT WANT TO DEVELOP A BEHAVIORAL REQUIREMENT WHICH WILL REQUIRE TRAINEES TO ACTUALLY PERFORM THE TASK.

Examples of unacceptable verbs and verb phrases for either type of STS/CTS statements include:

Have a knowledge of
Demonstrate a working knowledge
Become thoroughly familiar with
Understand
Develop an appreciation for
Become oriented to

Qualify the Action Verb(s) for a Complete Specification

You must start by selecting an action verb that communicates a behavior that can be observed and measured. But the action verb alone is obviously insufficient. For that reason, another element must be added. The action verb must be accompanied by an object. The action verb itself answers the question, "Do what?" But there is another question that must be answered, "To what?" Consider this example:

Do what? Label (action verb)
To what? Components (object)

TABLE A–4
EXAMPLES OF ACTION VERBS FOR EACH TYPE OF KNOWLEDGE ITEM

INFORMATION	MENTAL SKILL
Define	Analyze
Describe	Apply (a rule)
Enumerate	Calculate
Explain	Classify
Express	Compare
Identify	Compute
Label	Contrast
List	Demonstrate
Name	Derive
Recall	Discriminate
Recite	Evaluate
Recount	Forecast
Relate	Generate (a solution)
Repeat	Predict
Select	Prove
Show	Solve
State	
Tell	
Write	

This type of statement communicates what will be done to what. Remember: Your action verb must be accompanied by an object.

After you have specified a behavioral requirement (i.e., used and qualified action verbs), you should write it in the column next to the STS/CTS task statement on the type of form shown in Figure A-1 (p. 27). If the STS/CTS task statement and the behavioral requirement are the same, indicate that by writing "SAME" in this column.

CONVERT BEHAVIORAL STATEMENTS TO PRELIMINARY PERFORMANCE REQUIREMENTS (PPRs)

The next step is to convert each behavioral statement into a PPR. PPRs are direct translations of behavioral requirements into the following:

- o A specific description of the behavior the trainee is to exhibit after training.
- o The conditions under which the action will take place.
- o The standards of performance which must be achieved.

The Behavior Part of a PPR

If you have followed the prescribed procedures, you already have the behavior part of the PPR. The behavioral requirement from the form shown in Figure A-1 (p. 27) will be the behavior part of the PPR.

The Conditions Part of a PPR

A properly prepared PPR clearly states the limits and/or conditions of trainee performance. This portion of the PPR describes important aspects of the training environment. There are six common types of conditions and they are indicated in Table A-5 along with a detailed explanation of each. You will have to determine, for each behavioral statement, which type(s) of conditions apply and the specific nature of each condition.

The Standards Part of a PPR

The third requirement for a well prepared PPR is a clearly stated, observable, measurable standard of performance. There are several common types of standards and they are indicated in Table A-6 along with examples of each. You will have to determine which of the seven types of standards given in the table the trainee will have to meet.

When writing standards, quantify where possible. Remember, however, that some types of standards are qualitative, and not easily quantified.

1. Many standards are quantifiable:
   a. Exact number of words typed per minute.
   b. Following 10 steps in a procedure.
   c. Listing the 206 bones in the human body.
2. Some standards are qualitative and not directly quantifiable:
   a. Adjusting a carburetor until the engine runs at its smoothest point.
   b. Making a patient feel comfortable.

When stating standards you should also attempt to insure that the levels of performance specified are both acceptable and attainable. Standards will be acceptable to the extent that they accurately reflect the proficiency levels specified in the STS/CTS. They will be attainable to the extent that the trainees can realistically be expected to achieve the level of performance specified.

SUBMIT PPRs TO SMSs FOR REVIEW

You may have noted that this task analysis process calls for consultation with SMSs at a number of different points. The first of these SMS reviews occurs when you have completed the conversion of behavioral requirements into PPRs. You will want an SMS (preferably two) to examine your initial PPRs to make sure they are accurate reflections of the behavioral requirements (taking proficiency level into account).

TABLE A–5
TYPES OF CONDITIONS FOR PPRs

9–1837

SIMULATED OR REAL-LIFE SITUATIONS	If you remember that PPRs specify what the student will do during instruction in a training situation, then you will realize that the real-life performance is not always possible in the course. For example, there are numerous trainers and simulators designed to simulate an aircraft or other system; however, they usually simulate real-life performance. In addition, some tasks which are decision making in nature can be simulated. For example, if the task is to isolate a malfunction in an electrical system, in some cases the student can be given some malfunction results and be required to use diagrams and schematics to isolate the malfunction. In this example, your objective should make clear that the student is working with diagrams and schematics instead of actual equipment.
EQUIPMENT	Another important condition that applies to many PPRs is equipment such as special tools or devices the student must use when he performs the objectives. If it is commonly understood that certain tools will be used, then it is not necessary to specify them. However, it is not wrong if you do so. In many cases, special tools or equipment are required and should be specified as a condition. Example: "Given 6RB1 testing meter . . . ." "Given toolkit 12–1 . . . ."
PROCEDURAL AIDS	There are many tasks which require the student to follow procedural aids. Two examples of such aids are checklists and TOs. Many of the tasks in your course might require the appropriate TO as one of the conditions. Hence, an objective might read, "Using TO . . . ." or "Given TO . . . ."
REFERENCES	There are some tasks or knowledge-demonstrating activities that are not accomplished from memory – the students, like the man on the job, must use a reference. So if the task or activity requires direction from a manual or other publication (other than TO which is considered a procedural aid) then your objectives must include it as a reference. Example: ". . . . using AFM XX-XX . . . ."
SUPERVISION	During the student performance of the objectives, it is understood that an instructor will be present to evaluate. In this sense, supervision is always present. But for some tasks, it might be desirable to allow the instructor to provide limited assistance or correction. This is compatible with what actually happens on the job, since a supervisor must see that a task is performed correctly. And in order to assure a good finished production, it is necessary for him to make corrections from time to time. Sometimes the same is acceptable in a training situation, especially with the higher proficiency levels. For example, if the student makes certain mistakes he might endanger himself, damage equipment, or cause an unnecessary delay (especially if other students are waiting to use the same equipment). In such situations, limited supervision can become a condition. This may be written as: "Given limited instructor assistance . . . ." ". . . . with limited instructor supervision."
OTHER ENVIRONMENTAL CONDITIONS	Sometimes the student can be provided the actual equipment but must do something to it in an environment or situation different from that encountered on the job. For example, on the job a certain component is repaired in the aircraft, but in the training situation it must be repaired on a workbench. Another example would be to require the student to park a jeep on concrete, but in real-life the jeep might be parked in snow, mud, ice, or on concrete. You should always specify any environmental conditions in the training situation.

TABLE A–6
TYPES OF STANDARDS FOR PPRs

9–1836

DESCRIBE STANDARDS BY	EXAMPLES
Specifying Degree of Accuracy	– Solve at least 18 of 21 problems correctly – Match 25 of 28 items correctly – Perform at least 14 of 16 steps correctly
Specifying Degree of Supervision	– Instructor may not make more than 3 corrections – The student may ask no more than 3 questions pertaining to procedures
Specifying Quality of Finished Product	– Adjustment must produce a meter reading of "0" – The engine must run smoothly at 4500 rpm – All panels must light up when master switch is turned on
Specifying Content of Finished Product	– Write a report to include at least three recommended solutions
Specifying Time Limits	– Within five minutes
Referring to Standards Prescribed Elsewhere	– In accordance with (IAW) Technical Order (TO)
Implying Standard of No Error	– Student will perform without error

Specifically, you must ask them to tell you if:

- o The behavior part of the PPR accurately captures the essence of the STS/CTS item.
- o The behavior part of the PPR is correctly stated.
- o The conditions part of the PPR is correct, complete, and realistic.
- o The standards part of the PPR is acceptable and attainable.

The SMSs you select to review the products of your task analysis (at all stages) must be intimately familiar with the specialty. This means that a SMS having extensive field experience would make a better technical advisor than one who is an excellent instructor but is limited in actual operational experience. The ideal SMS is one with both instructor experience and recent "hands on" operational experience.

The SMS reviews (at all stages) are actually comprised of a series of important steps. SMSs will review your work and may suggest changes. After examining the suggestions, you should convene the SMSs as a group to discuss these suggestions at length. You should act as chairman and should prepare an agenda (based on the individually submitted suggestions) prior to the meeting. Both common and unique criticisms should be addressed. After achieving consensus, the initial PPR should be revised as necessary.

To review, the three steps in the SMS review are:

- o SMSs working individually suggest changes.
- o SMSs convene to discuss changes and arrive at a consensus.
- o Analyst revises as necessary.

DOCUMENT PPRs

You must now formally document the revised PPRs. This is accomplished by recording the PPR in the upper left area of the Task Analysis Documentation Form (Figure A-2). First record the STS/CTS Task Statement. Then record the behavior, conditions, and standards of the PPR in the appropriate spaces.

TASK ANALYSIS DOCUMENTATION FORM

9-1832

STS/CTS TASK STATEMENT:	
BEHAVIOR:	COURSE NO: _____
CONDITIONS:	STS/CTS NO: _____ DATED: _____
STANDARDS:	DUTY: _____
REFERENCES:	DATE: _____ PAGE _____ OF _____
	ANALYST: _____
	STS/CTS REF: _____ PROF. CODE _____

STEP NO.	STEP (SUBTASK/DECISION QUESTION)	DECISIONS		GO TO STEP	SUPPORTING SKILLS AND KNOWLEDGES
		YES	NO		

FIGURE A–2 TASK ANALYSIS DOCUMENTATION FORM

STAGE B: IDENTIFICATION OF SUBTASKS

DETERMINE TYPE OF TASK REFLECTED IN STS/CTS TASK STATEMENT

Before a task (or behavioral statement) can be partitioned into its component subtasks, the type of task reflected in the STS/CTS Task Statement must be determined because each type of task is analyzed differently.

Task Statements will contain one of two primary types of tasks: procedural and nonprocedural.

a. Procedural Tasks - Procedural tasks are those in which the task to be taught is a series of steps which must be performed in a specific sequence if the task is to be accomplished properly. There are two basic types of Procedural Tasks:

   (1) Fixed Sequence Tasks - A fixed sequence task is composed of a series of steps performed in a prescribed, nonvariable sequence. Examples of such tasks are starting a jet engine or removing a component from a computer.

   (2) Variable Sequence Tasks - Instead of a fixed, nonvariable sequence, variable sequence tasks contain decision points where the continued performance of the task depends on the condition or circumstance discovered at the decision point. For example, in a troubleshooting task, test readings represent important decision points. The series of steps involved in isolating a fault in a vehicle's electrical system vary depending on the results of individual tests. For example, assume that the voltage reading across a switch is supposed to be 9-11 volts. If the reading is 9.26 volts (in the acceptable range) troubleshooting or fault isolation procedures are continued. If the reading is below 9 volts, then the switch is defective and must be replaced before troubleshooting and verification of repair can continue.

b. Nonprocedural Tasks - Those tasks which are comprised of subtasks which do not need to be performed in any particular order are considered nonprocedural tasks.

SELECT ANALYSIS TECHNIQUE

The Task Diagram

Since the two primary types of tasks, procedural and nonprocedural, are different in nature they will require different analytical techniques. Both task types require that you construct a "diagram" of the task but these diagrams will be somewhat different depending on task type. Essentially each task diagram will indicate the subtasks that comprise the task and the relationships between subtasks. Preparing diagrams will help insure that you have included all the subtasks that comprise a task and that you have specified relationships appropriately.

For the present, our only concern is with the nature of these task diagrams. The sources of information for determining what the subtasks actually are will be covered in the section on the following page (IDENTIFY SUBTASKS).

Procedural Task Diagrams

Since procedural tasks involve step by step procedures the best approach to diagramming these type of tasks is in the form of flowcharts. For fixed sequence procedural tasks this is a relatively straightforward procedure and your task diagram (flowchart) would look like the one shown in Figure B-1.

For variable sequence procedural tasks, the flowchart would be somewhat more complex since you must indicate decision points. Examples of flowcharts for these types of tasks are shown in Figures B-2 and B-3.

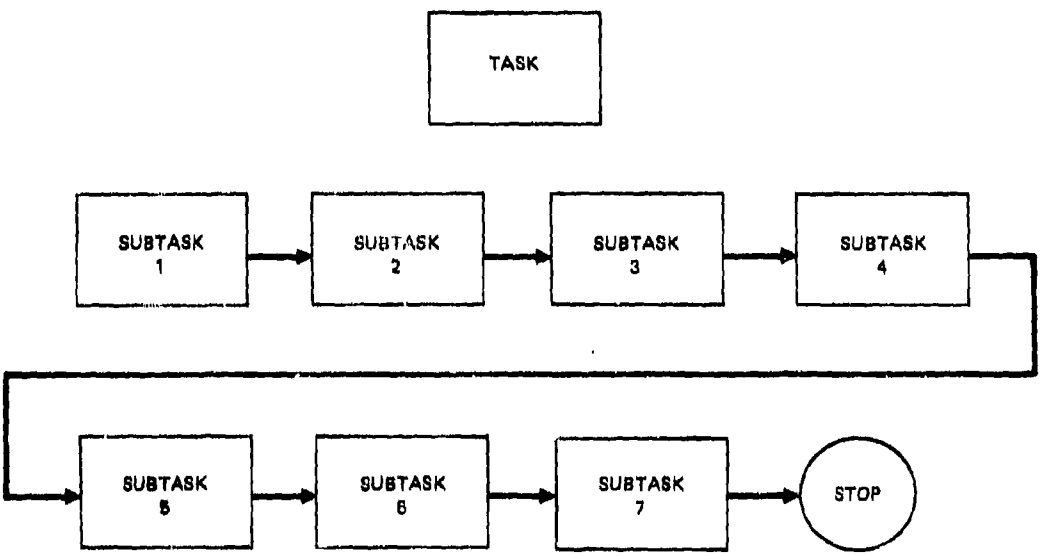

FIGURE B–1 SAMPLE TASK DIAGRAM (FIXED SEQUENCE PROCEDURAL TASK)

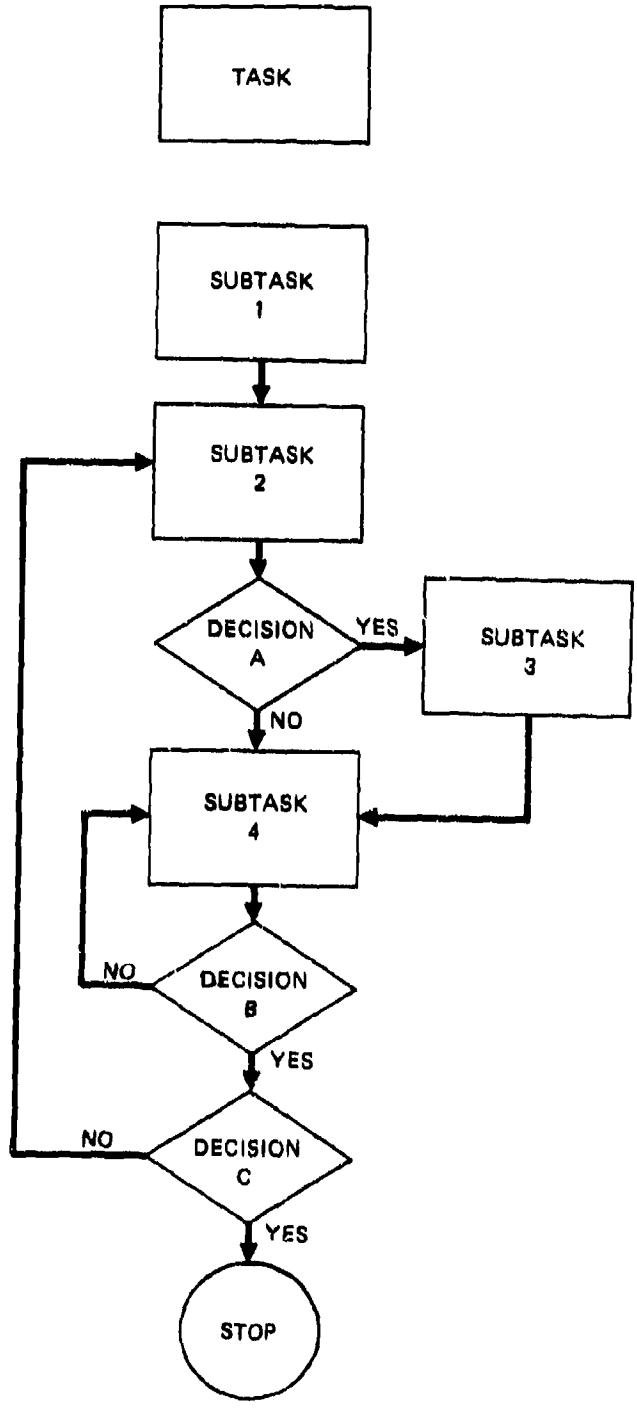

FIGURE B–2 SAMPLE TASK DIAGRAM (VARIABLE SEQUENCE PROCEDURAL TASK)

9-1842

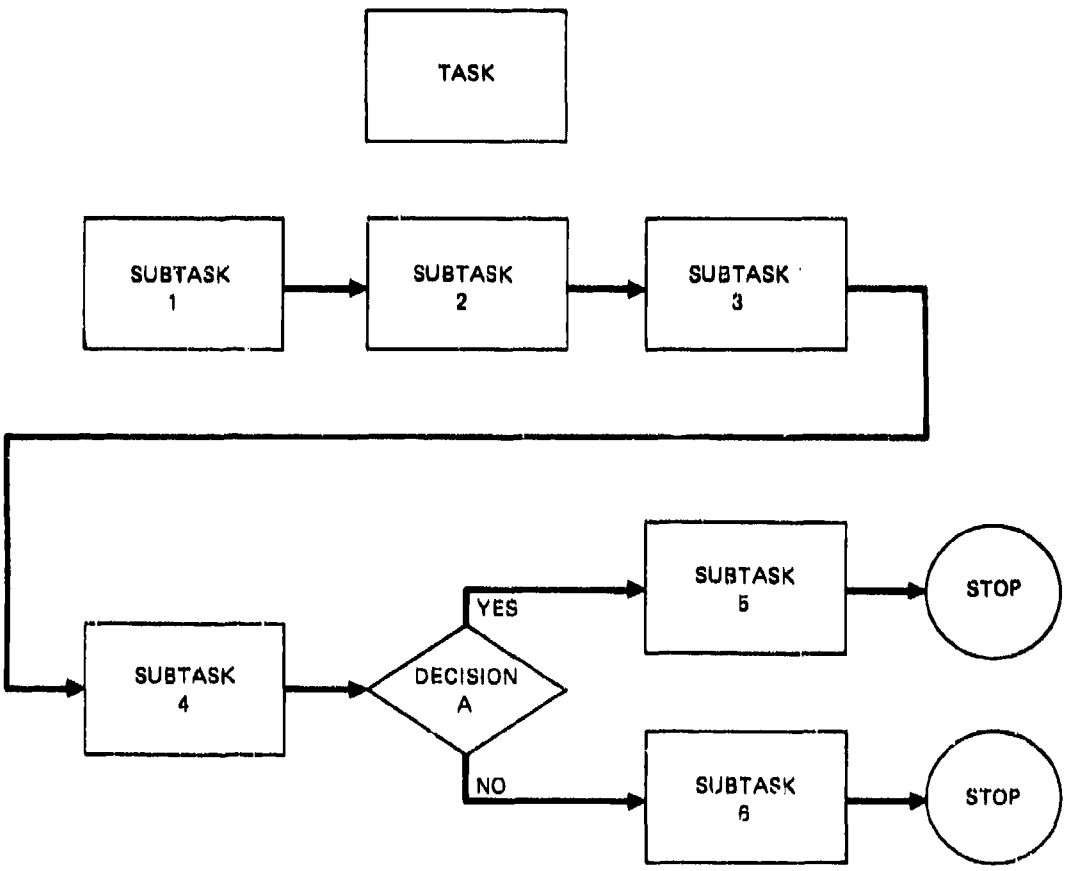

FIGURE B–3 SAMPLE TASK DIAGRAM (VARIABLE SEQUENCE PROCEDURAL TASK)

In each of these diagrams, subtasks are indicated by "boxes", and decision points are indicated by "diamonds." Boxes should contain behavioral statements, diamonds should contain questions. Make sure that the SMSs who review these diagrams are aware of this coding and understand the type of entry appropriate for each diagram component.

Occasionally you may encounter a task which requires that most of the component subtasks be performed in a prescribed sequence, yet contains other subtasks which can be performed in any order. When this occurs treat the entire task as procedural and use your judgment to specify a fixed order of completion for those subtasks which don't really require one.

For some tasks you may have to analyze, there already exist detailed step by step procedures (subtasks and decisions) such as those contained in T.O.s. If this is the case and you deem them to be an accurate breakdown of the task (see. p. 47 - Document Study), then it will not be necessary to write out the steps completely in the task diagram. However, you still need to draw boxes and diamonds and adequately reference the subtask or decision inside the box. This reference must be complete enough so that other individuals who have both the task diagram and the appropriate T.O. before them will be certain as to which subtask or decision you intended to be placed inside the box or diamond.

Nonprocedural Task Diagrams

For nonprocedural tasks you should also prepare diagrams, but they will tend to be rather simple. Since they do not involve a sequence of steps to be followed, you simply place the subtasks below the task on the diagram. There are no interconnecting arrows. An example of such a diagram is shown in Figure B-4.

FIGURE B–4 SAMPLE TASK DIAGRAM (NON-PROCEDURAL TASK)

IDENTIFY SUBTASKS

General

Having determined the type of task reflected in the STS/CTS Task Statement and having selected an appropriate analysis technique (type of task diagram), you must proceed by further reducing each task into its component subtasks. Although a distinction was made between task performance and task knowledge STS/CTS items, you should note that subtasks must be identified for both types of items. While the nature of the PPR may differ for each type of item you must still reduce each task (as expressed in the Task Statement) into its component subtasks.

When identifying subtasks during a task analysis, keep these questions in mind.

- o Do I have a logical breakdown of the task?
- o Can each subtask be measured?
- o Do I have all the necessary steps listed for the trainee to perform the task?
- o Do they represent the major steps of the task?

REMEMBER
Subtasks are actions.
Always use Action Verbs.

There are several methods for identifying subtasks. Two of the best techniques are the document study and task observation. Each is discussed, in turn, below.

Document Study

The document study is probably the most important action in determining the nature of tasks. This will be particularly true if you are revising a course, since there is undoubtedly a great deal of information contained in existing course documents relevant to the task analysis effort.

The document study must be as thorough as possible. Table B-1 lists the major documents available to you in conducting the task analysis and their primary uses. It is necessary to raise some general cautions when using any of these documents. First, tasks are frequently described at an inappropriate level of detail. There are no iron-clad rules for determining an appropriate level of detail for specifying subtasks. But, use enough detail so a person possessing all the necessary knowledges and trained in the skill(s) could peform the task by referring to the task diagram (See Table B-2). Second, essential or necessary actions are sometimes omitted from the task documentation. This can happen, for example, if the job has changed since the documentation was prepared. You must make sure that all necessary subtasks are included. Insure that each subtask is separate and distinct, and that activities do not overlap.

In the document study the following steps are to be accomplished:

- o Select the documents you will be using.
- o Review all the documents for
  - content
  - sequencing
  - relevant technical data
- o Acquaint yourself with terminology
- o Sort selected documents according to the types of information given:
  - System requirements and functions data.
  - Listings of duties, tasks, and subtasks.

TABLE B–1

DOCUMENTS USED FOR DOCUMENT STUDY

NAME OF DOCUMENT	WHERE PROCURED	SYNOPSIS	USE
System Planning Data, SOM, Feasibility Studies, PMP, PMD, and Test Plans	Obtain from contractor through System Program Office (SPO) Major Command	Provides information on equipment systems undergoing modification or development (aircraft, missiles, detection and warning systems)	Provides information on • Systems mission and performance characteristics • Concepts, policies, and/or procedures for system activation, operation, maintenance, and support • Management responsibilities
Contractor Data (blueprints, drawings, block diagrams, specifications and standards, reports and test, purchased through SPO (AFR 80-14)	Obtain from contracor through SPO, Major Command	Describes in functional terms the subsystems, equipment, or components required to achieve system objectives	Provides: • Performance and design requirements equipment personnel functions • Support equipment, operation, and maintenance • Subsystems equipment and personnel • Personnel performance requirements • Personnel training, training equipment, and technical data requirements
Occupational Survey Reports (OSR)	ATC/OMY Randolph AFB, Tex.	Provides a detailed listing of what man's role is in the mission	Gives listing of: • Duties • Tasks • Subtasks Task Data: • Number of performing • Percent performing • Training Emphasis • Learning difficulty • Time spent
Air Training Command (ATC) Course Control Documents	ATC Prime Technical Training Center	The following listed documents are used by USAF ATC. Other government agencies probably have similar documents	*These documents are consulted when systems are being revised or lateral courses are being developed*
Course Chart (C C)	ATC Prime Technical Training Center	An ATC qualitative course control document	Gives • Course identity • Length • Security classification • Major items training equipment • Summary of subject matter taught by blocks and units of instruction
Plan of Instruction (POI)	ATC Prime Technical Training Center	An ATC course control used for course development, implementation, and operation	Gives • Specific objectives • Training times by lesson • STS/CTS correlation by objective • Listing of instructional materials • Audiovisual aids • Training equipment • Training methods • Instructional guidance

TABLE B–1

DOCUMENTS USED FOR DOCUMENT STUDY (Continued)

NAME OF DOCUMENT	WHERE PROCURED	SYNOPSIS	USE
Lesson Plan	ATC Prime Technical Center	A guide for teaching used by the instructor for effective attainment of objectives	Contains a list of • Objectives • Teaching steps • Other pertinent information deemed necessary by instructors
Course Training Literature	Appropriate activity conducting training	Identifies actual skills and knowledges being taught to the student. The training literature is what the student is receiving in training	Provides • Task • Subtasks • Activities • Performance standards
Career Development Course (CDC)	ECI Gunter AFS, AL	Provides a complete training program for all knowledges required for a given AFSC	Provides • Skills • Knowledges • Teaching points • Standards
Officer Classification Manual (AFR 36-1) and Airman Classification Manual (AFR 39-1)	Air Force publications channel	Defines the total job content	Provides • Duties • Responsibilities • Qualifications
Commercial Texts	Base library, section library, civilian library, local purchase through supply chanels	Covers an array of subject matter in any detail necessary	Determines and provides • Skills • Knowledges • Teaching points • Performance • Standards • Conditions • Duties • Responsibilities
Air Force Regulatory Publications (Regs, Manuals, Pamphlets)	Normal Air Force publication channels	Gives policies, procedures, and specific instructions on how duties and tasks are to be accomplished	Gives detailed listings of • Duties • Tasks • Subtasks • Performance standard
Procedural Publications (TOs, TMs)	Consult TO 00-5-2	Gives specific instructions on how duties and tasks are to be accomplished	Gives detailed listings of • Duties • Tasks • Subtasks • Performance standard • Sequencing

TABLE B–2
APPROPRIATE AND INAPPROPRIATE LEVELS OF DETAIL FOR SPECIFYING SUBTASKS

FAR TOO DETAILED	TOO DETAILED	ADEQUATE DETAIL	POSSIBLY TOO LITTLE DETAIL
Turn left and face tool kit. Unlatch tool kit by lifting catch. Open tool kit by swinging lid up. Remove small parts tray. Find small screwdriver at left rear of tool kit. Grasp screwdriver by handle with right hand. Remove screwdriver from tool kit. Turn right and face work bench.	Open tool kit. Pick out small screwdriver. Grasp by handle with right hand. Hold chassis with left hand so that underside faces you. Insert screwdriver in hole for potentiometer P–3 (next to transformer). Turn P–3 1/3 turn to right. Observe that VTVM reading is between 20–22 VDC. Readjust P–3 (no more than 1/3 turn in either direction) until VTVM reads 20–22 VDC. Remove screwdriver from P–3. Lower chassis. Return small screwdriver to tool kit.	Use small screwdriver to adjust potentiometer P–3 from underside of chassis. Turn P–3 slowly to the right until VTVM reads 20–22 VDC.	Adjust P-3 until VTVM reads 20–22 VDC.

- Task data.
- Descriptions of task activities and performance standards.
- Listings of supporting skills and knowledges.

Task Observation

When identifying the subtasks which comprise a procedural task it is often useful to observe a SME performing the task under either simulated or actual job performance conditions.

Purposes of Task Observation

1. Establishment of Practical Procedures. Since many jobs can be performed in a variety of acceptable ways, the restricting of a procedure to one style or method of performance might result in the establishment of a dogmatic, limited approach. While the purpose of task observation is not necessarily to establish a single approach, you do want to select one correct, practical procedure that can be taught in the training for the task.

2. Verification of Procedures. The task observation is a good procedure to verify findings of the document study.
3. Firsthand Knowledge. The task observation can add to your background if you are not completely familiar with how the task is performed. By observing the task being performed, you can gain firsthand knowledge of how it is done.
4. Correlation of Written Directions with Actual Performance. The task observation is also a good technique to reconcile differences between how the procedure is written and how it is actually performed.

Task observation should ideally take place in the job environment. However, observation in the field is usually time-consuming and costly. There may be times when on-base facilities provide job conditions under which the performance may be observed. For procedural tasks it is desirable to observe the SMS in addition to performing a document study. In the event that such observation is not possible, you must depend on your own subject matter expertise and/or SMS interviews.

If task observation is feasible (it may be your best source of information in developing a new course), follow the task observation guidelines presented in the section that follows.

Procedure for Task Observation

Study the sample Task Observation Chart shown in Table B-3 as you review the steps below.

1. List the steps. The task analyst must list each overt act the SMS performs. Do not anticipate anything; do not assume anything. There may be specific reasons for each act which are not obvious to you. If the steps are performed in a particular sequence, indicate the sequence numerically.

2. Indicate how steps are performed. Include a brief description and explanation of how each step is performed.
   - o State exactly what is done.
   - o State how it is done.
   - o Identify all equipment and how it is used.
   - o If decisions must be made during the procedure, indicate where they are made and give a short description indicating the nature of the decision.

TABLE B–3
SAMPLE TASK OBSERVATION RESULTS

9–1846

DUTY: Adjust Laboratory Equipment TASK: Perform pre-operational check on the MV-1 Generator	
STEPS PERFORMED	HOW PERFORMED
1. Turn master switch to "Standby" position	1. Depress "Standby" button.
2. Adjust voltage to 150 VDC.	2. Turn "Line Adjust" knob clockwise.
3. Turn master switch to "Manual" or Automatic" position.	3. Decision: Turn to "Manual" position when the ammeter indicates a fluctuation in line voltage, and "Automatic" when no fluctuation exists.
4. Turn "Ready" switch to ready position.	4. Depress "Ready" switch.
5. Turn "Operate" switch to "On" position.	5. Throw knife switch to "On."

REVIEW BY SMSs

Recall that upon completion of the PPRs you asked SMSs to review them and then you revised them as appropriate. You must now call upon at least two SMSs (preferably the same ones used previously) to review your task diagrams. The purpose of this review is to verify, supplement, clarify, and revise your diagrams. It is important that you ask the SMSs to consider the following questions when reviewing the task diagrams:

- o Are all the subtasks shown?
- o Are the subtasks accurately stated?
- o Is the order (if applicable) of subtasks correct?
- o Are decisions being made at appropriate points?
- o Are all alternative decisions listed?

As was the case for SMS reviews in Stage A, this SMS review consists of three steps. The SMSs first suggest changes individually, then discuss the changes as a group and reach a consensus, and finally the analyst revises the subtasks as necessary.

STAGE C: IDENTIFICATION OF SUPPORTING SKILLS AND KNOWLEDGES

ANALYZE SUBTASKS

Now that you have identified the subtasks (major steps) that comprise each task, your next step is to identify those skills and supporting knowledges required to support the performance of each subtask. To refresh your memory about supporting skills and knowledges, review the description of each given on pages 8 and 10 of the Introduction.

Like the subtasks they support, the skills and knowledges are derived from many sources. Document studies, personal experiences, and task observations all provide information regarding required supporting skills and knowledges. However, it is important to stress that although these information sources are useful, the process of identifying supporting skills and knowledges is largely an inferential process. That is, a number of subjective judgments by you and other SMSs will be required in determining what a trainee actually needs to be able to do and must know in order to perform each subtask. Examples of supporting skills and knowledges would be "use of oscilloscope", "safety precautions", and "location of fuse".

The Task Diagram

Before presenting some guidance on how to actually identify supporting skills and knowledges, a few words on the task diagram generated as part of Stage B activities are necessary. In a certain sense these initial diagrams were incomplete and you now must complete each task diagram by indicating for each of the subtasks its supporting skills and knowledges. An example of what a completed task diagram will look like is given in Figure C-1. Notice that one of the subtasks has only knowledges, two have both skills and knowledges, while another has only a skill.

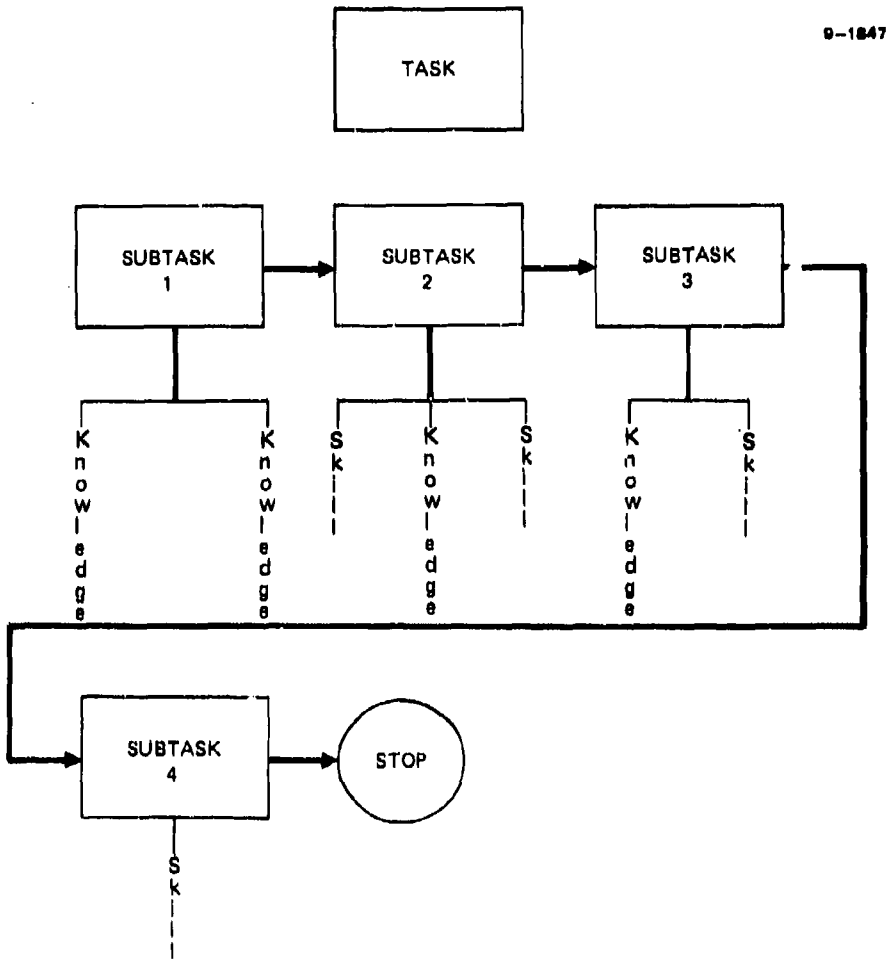

FIGURE C–1 SAMPLE COMPLETE TASK DIAGRAM (FIXED SEQUENCE PROCEDURAL TASK)

It may turn out that your task diagram contains a large number of subtasks, and little room is left for recording supporting skills and knowledges. When this occurs it is recommended that you photocopy the diagram and paste portions of it onto separate sheets of paper. This will give you sufficient room to record the supporting skills and knowledges.

IDENTIFY SUPPORTING SKILLS

You need to identify which physical and/or manipulative skills are required to perform each subtask and make each decision (in variable sequence tasks). Tables C-1 and C-2 provide some examples of physical and manipulative skills, respectively. These are offered primarily as the types of skills you will want to consider. There may be others that you feel should be included and if appropriate you should certainly include them.

Despite the emphasis on the use of action verbs presented earlier when discussing subtasks you should note that you do not necessarily need an action verb for supporting skills. Action verbs will be attached to supporting skills when learning objectives are prepared.

Once you have identified the required supporting skills, you need to record them on the task diagram. As a check on the supporting skills, you should ask how job performance would be degraded without each one. If there would be no significant degradation of performance, eliminate the skill. Also, for each remaining supporting skill you need to determine if trainees are likely to have already acquired it. The results of a Survey Test, if available, will tell you what prospective students (the target population) know or can do before receiving instruction. However, if Survey Tests are not available, you will need to rely on your experience and ask yourself if students are likely to have already acquired the supporting skill. In any case, if you determine that students are likely to already have acquired the supporting skill you should eliminate it from the task diagram.

TABLE C–1
TYPES OF PHYSICAL SKILLS

9–1850

PHYSICAL PROFICIENCY	EXAMPLE
Strength	
• Explosive – exerting maximum energy in one instantaneous act.	Broad jumping
• Dynamic – moving or supporting the weight of the body.	Rope climbing
• Static – continuously exerting a maximum force for a brief period of time	Lifting weights
Flexibility	
• Dynamic – making repeated, rapid, flexing movements in which muscles must recover from the strain quickly.	Deep-knee bends
Speed	
• Changing directions.	Dodging runs
• Running	Short and medium dashes
• Limb movement – moving arms or legs as rapidly as possible.	Rapidly inflating a tire with a hand pump
Balance	
• Static – maintaining bodily equilibrium in some fixed position.	Standing on one foot
• Dynamic – maintaining balance while performing a task.	Rail walking
• Balancing objects	Loading equipment in overhead racks
Coordination	
• Multi-Limb – Coordinating the simultaneous movement of two hands, two feet, or hands and feet in operating various devices.	Driving a car
• Gross body – controlling gross activity of the whole body.	Jumping rope
Endurance	
• Maintaining maximum effort over long periods of time.	Doing as many pullups as possible.

TABLE C–2
TYPES OF MANIPULATIVE SKILLS

9–1851

MANIPULATIVE PROFICIENCY	EXAMPLE
Control precision – making fine, highly controlled muscular adjustment.	Turning the jets of a carburetor.
Multi-limb coordination – coordinating the movements of a number of limbs simultaneously.	Controlling rudder and manipulating throttle
Response orientation – making the correct movement in relation to the correct input, especially under high-speed conditions.	Emergency braking (as opposed to incorrectly depressing the clutch)
Reaction time – speed with which an individual is able to respond to an input when it appears.	Applying brakes at stop signal soon enough to stop.
Rate control – making continuous, anticipatory motor adjustments relative to changes in speed and in direction of a continuously moving object	Tracking a target on a display
Manual dexterity – making skillful, well-directed arm-hand movements in manipulating fairly large objects under speed conditions.	Planning a board or otherwise working with hand tools.
Finger dexterity – making skillful, controlled manipulations of tiny objects, primarily using the fingers.	Repairing a watch
Arm-hand steadiness – making precise arm-hand positioning movements when strength and speed are minimized.	Assembling a printed circuit board.

IDENTIFY SUPPORTING KNOWLEDGES

You also need to identify the knowledges required to support subtask performance or decision-making. Table C-3 indicates some types of supporting knowledges you might want to consider. Record only those knowledges essential for subtask performance. Do not include those knowledges which are "nice-to-know." It is possible that there may be some subtasks or decisions that do not have supporting knowledges. As was the case for supporting skills, you do not necessarily need to attach an action verb to supporting knowledges.

Once you have identified the required supporting knowledges, you need to record them on the task diagram. As a check on the supporting knowledges you should ask how job performance would be degraded without each one. If there would be no significant degradation of performance, eliminate that knowledge. Also, for each remaining supporting knowledge you need to determine if trainees are likely to already know it. Survey Tests results are the best source of information in making this determination, but if not available you will have to rely on your own experience by asking yourself if students are likely to know it. In any case, if you determine that prospective students are likely to already know a particular supporting knowledge, eliminate it from the task diagram.

REVIEW BY SMSs

The task diagrams are now complete. They include subtasks and supporting skills and knowledges. They should be submitted to at least two SMSs for review. The SMS reviews are intended to verify, supplement, clarify and modify the diagrams as necessary. In the course of their review, the SMSs should be concerned with:

- o completeness of the skills and knowledges
- o accuracy of the skills and knowledges
- o necessity of the skills and knowledges

It is your responsibility to alert the SMSs to these review criteria.

TABLE C–3
TYPES OF SUPPORTING KNOWLEDGES

9–1852

Primarily Factual Knowledges
- Terms, jargon, codes
- Names and location of objects, aids, and inputs
- Procedures for emergency situations
- Identification or recognition of objects or signals
- Interpretation of symbols, signals, or instructions
- Functional or organizational relationships
- Precautions

Knowledges Prerequisite to Skilled Performance
- Procedures for sets of activities
- Procedures for calculations
- Procedures for use of tools or test instruments

Complex Knowledges – Often Related to Complex Decisions
- Problem solution, diagnosis, or procedures for troubleshooting
- Anticipation of later conditions from earlier conditions
- Planning
- Strategies or tactics
- Inventions or improvisations

"Theory" Knowledges

When possible, don't identify the need for "theory" as a knowledge. Instead, identify:
- Appropriate rules of thumb-principles which relate **directly** to the tasks
- Specific inputs which require the knowledge
- **Proper** action(s) indicated by the knowledge

Again, the SMS review is a three step process in which the SMSs make suggestions individually, discuss them at length and reach a consensus as a group and necessary revisions are made by the analyst.

DOCUMENT TASK ANALYSIS

Having completed and revised the task diagrams, you are now ready to formally document the results of the task analysis. This is done on the Task Analysis Documentation Form (see Figure A-2, p. 38). You are already familiar with this form since you have previously used it to document the PPRs.

Assign Step Numbers to Subtasks and Decisions

Prior to completing the Task Analysis Documentation Form you must assign a step number to every subtask (box) and decision (diamond) in the task diagram. Place this step number above each box or diamond as shown in Figure C-2.

Completing the Form

For all types of tasks you should first record in the block labeled "references" the documents you used in the process of identifying subtasks and supporting skills and knowledges.

For fixed sequence procedural tasks you must indicate the step number and step (subtask or decision question) from the task diagrams in the appropriate column. Leave the "Decisions" column blank and indicate the number of the next step in the "Go to Step" column (if it is the last subtask indicate STOP). For each step indicate the supporting skills and knowledges in the last column. To illustrate how to complete the form for a fixed sequence, equipment-oriented, procedural task, a task diagram is shown in Figure C-2 and a corresponding completed Task Analysis Documentation Form is shown in Figure C-3.

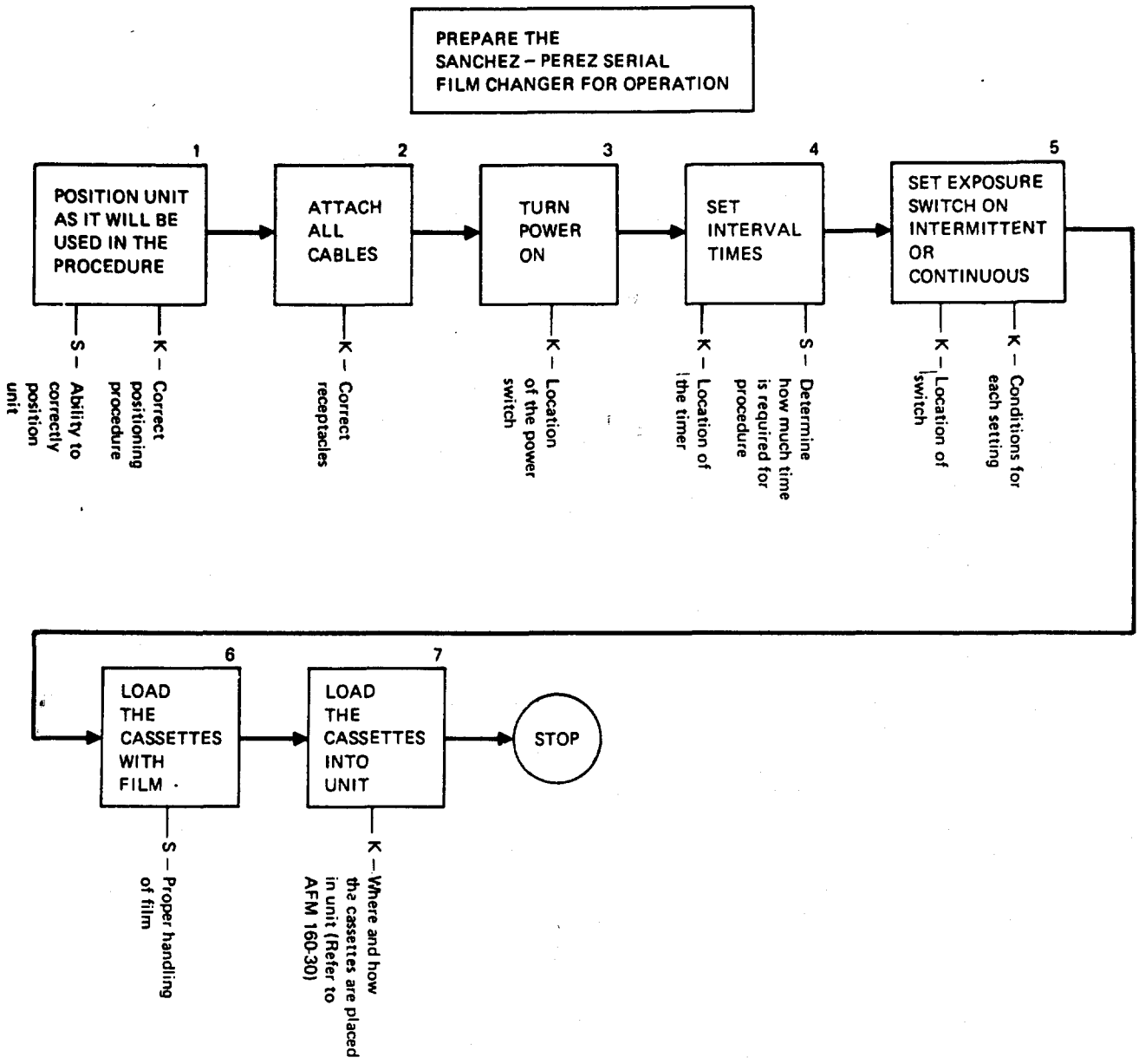

FIGURE C–2 TASK DIAGRAM (FIXED SEQUENCE, EQUIPMENT-ORIENTED TASK)

TASK ANALYSIS DOCUMENTATION FORM

9–1832

STS/CTS TASK STATEMENT: PREPARE THE SANCHEZ – PEREZ SERIAL FILM CHANGER FOR OPERATION

BEHAVIOR: PREPARE THE SANCHEZ PEREZ SERIAL FILM CHANGER FOR OPERATION

CONDITIONS: GIVEN THE NECESSARY EQUIPMENT

STANDARDS: IN ACCORDANCE WITH AIR FORCE MANUAL 160-30

REFERENCES: AFM 160-30

COURSE NO: 3ABR90330
STS/CTS NO: 903X0 DATED: NOV. 1978
DUTY: SPECIAL RADIOGRAPHIC PROCEDURES
DATE: 15 SEPT. 1978 PAGE 1 OF 1
ANALYST: BROWN
STS/CTS REF: 15i(6) PROF. CODE 3

STEP NO.	STEP (SUBTASK/DECISION QUESTION)	DECISIONS YES	DECISIONS NO	GO TO STEP	SUPPORTING SKILLS AND KNOWLEDGES
1	Position the unit as it will be used in the procedure			2	K – Correct positioning procedures S – Ability to correctly position the unit
2	Attach all cables			3	K – Correct receptacles
3	Turn power on			4	K – Location of the power switch
4	Set interval time			5	K – Location of the timer S – Determine how much time is needed
5	Set exposure switch on intermittent or continuous			6	K – Location of switch K – Conditions for each setting
6	Load the cassettes with film			7	S – Proper handling of film
7	Load the cassettes into the unit			STOP	K – Where and how the cassettes are placed in the unit (refer to AFM 160-30)

FIGURE C–3 COMPLETED TASK ANALYSIS DOCUMENTATION FORM
(FIXED SEQUENCE, EQUIPMENT – ORIENTED TASK)

For variable sequence procedural tasks complete the step number and step columns first. For subtasks, indicate in the "Go to Step" column the next step to proceed to (if it is the last subtask in a chain indicate STOP). For decision questions indicate in the "Decisions" column which step to proceed to if the answer is "yes" and which to proceed to if the question is "no." Also you must indicate the supporting skills and knowledges for each subtask in the last column. To illustrate how to complete the form for branching procedural tasks, task diagrams for two hypothetical variable sequence tasks are shown in Figures C-4, C-6 and C-8. The task diagrammed in Figure C-4 is from a nonequipment-oriented course while the tasks depicted in Figures C-6 and C-8 are equipment-oriented courses. Corresponding completed Task Analysis Documentation Forms for each task diagram are shown in Figures C-5, C-7 and C-9.

For nonprocedural tasks you only need to indicate the step number and step and supporting skills and knowledges on the form. The "Decisions" and "Go to Step" columns should be left blank.

COMPLETION OF TASK ANALYSIS

The task analysis portion of the ISD process is now complete. If you have done the job carefully, the results will provide training development personnel with a solid base for writing course objectives, subobjectives, test items, and eventually course materials. In addition, the results of your task analysis will also provide a basis for determining the types of training media which should be used in the course. The importance of a thorough task analysis process cannot be overemphasized.

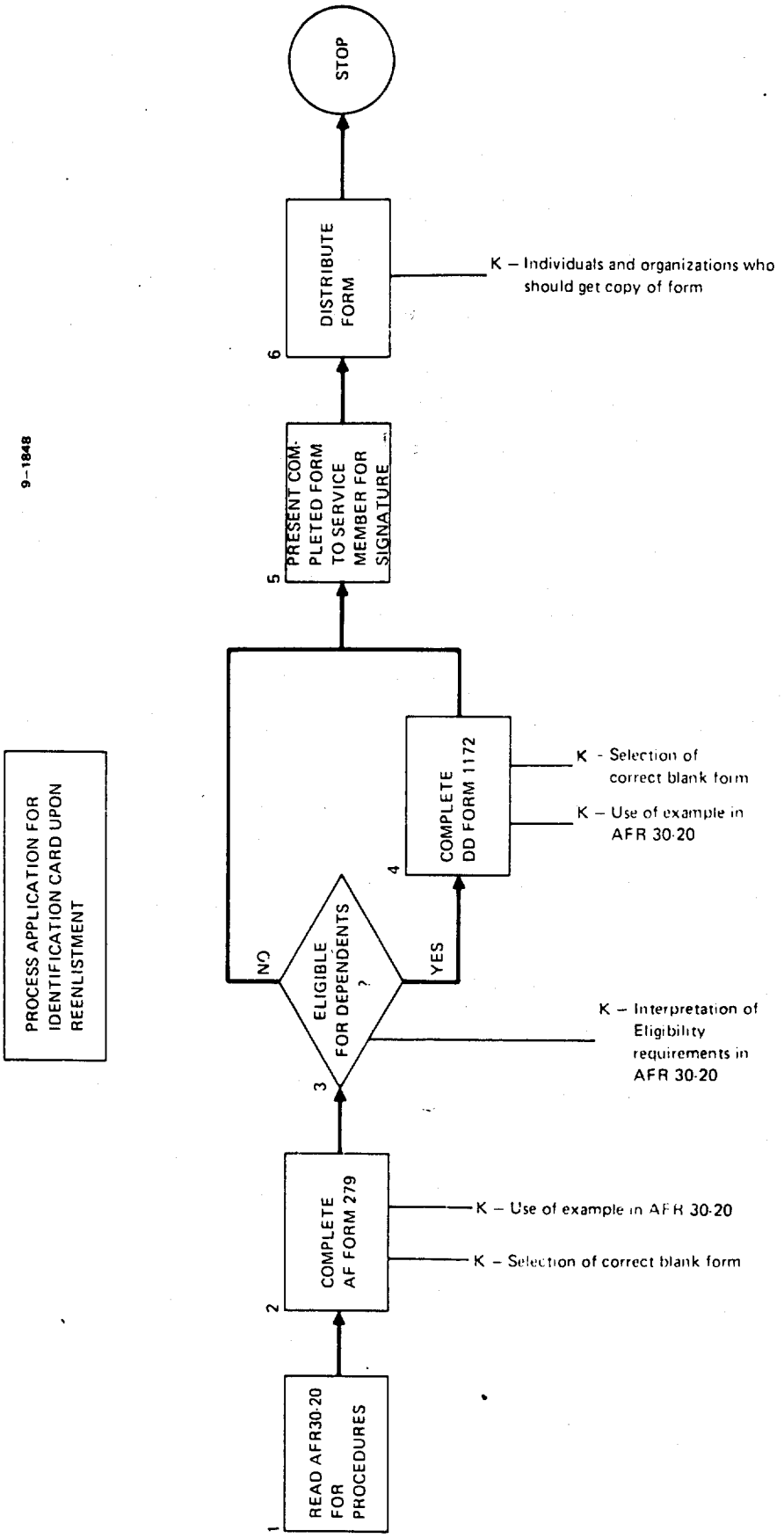

FIGURE C–4 TASK DIAGRAM (VARIABLE SEQUENCE, NONEQUIPMENT-ORIENTED TASK)

TASK ANALYSIS DOCUMENTATION FORM

9-1849

STS/CTS TASK STATEMENT: Process application for identification card upon reenlistment

BEHAVIOR: Process application for identification card upon reenlistment

CONDITIONS: Given AFR 30–20, Blank AF Form 279, and DD Form 1172 and using a reenlistment situation

STANDARDS: Will perform with 100% accuracy

REFERENCES: AFR 30–20

COURSE NO: 3ABR73230 DATED: _____
STS/CTS NO: 732X0
DUTY: Quality Force
DATE: 02 July 1978 PAGE 1 OF 1
ANALYST: John Doe
STS/CTS REF: 8i (1) PROF. CODE 1b

STEP NO.	STEP (SUBTASK/DECISION QUESTION)	DECISIONS YES	DECISIONS NO	GO TO STEP	SUPPORTING SKILLS AND KNOWLEDGES
1	Read AFR 30–20 for procedures			2	
2	Complete AF Form 279			3	K-Selection of correct blank form K-Use of example in AFR 30-20
3	Eligible for dependents?	4	5		K-Interpretation of AFR 30-20
4	Complete DD Form 1172			5	S-Selection of correct blank form K-Use of example in AFR 30-20
5	Present completed form to service member upon reenlistment for signature			6	
6	Distribute Form			STOP	K-Individuals and organizations who should get copy of form

FIGURE C–5 COMPLETED TASK ANALYSIS DOCUMENTATION FORM (VARIABLE SEQUENCE, NONEQUIPMENT-ORIENTED TASK)

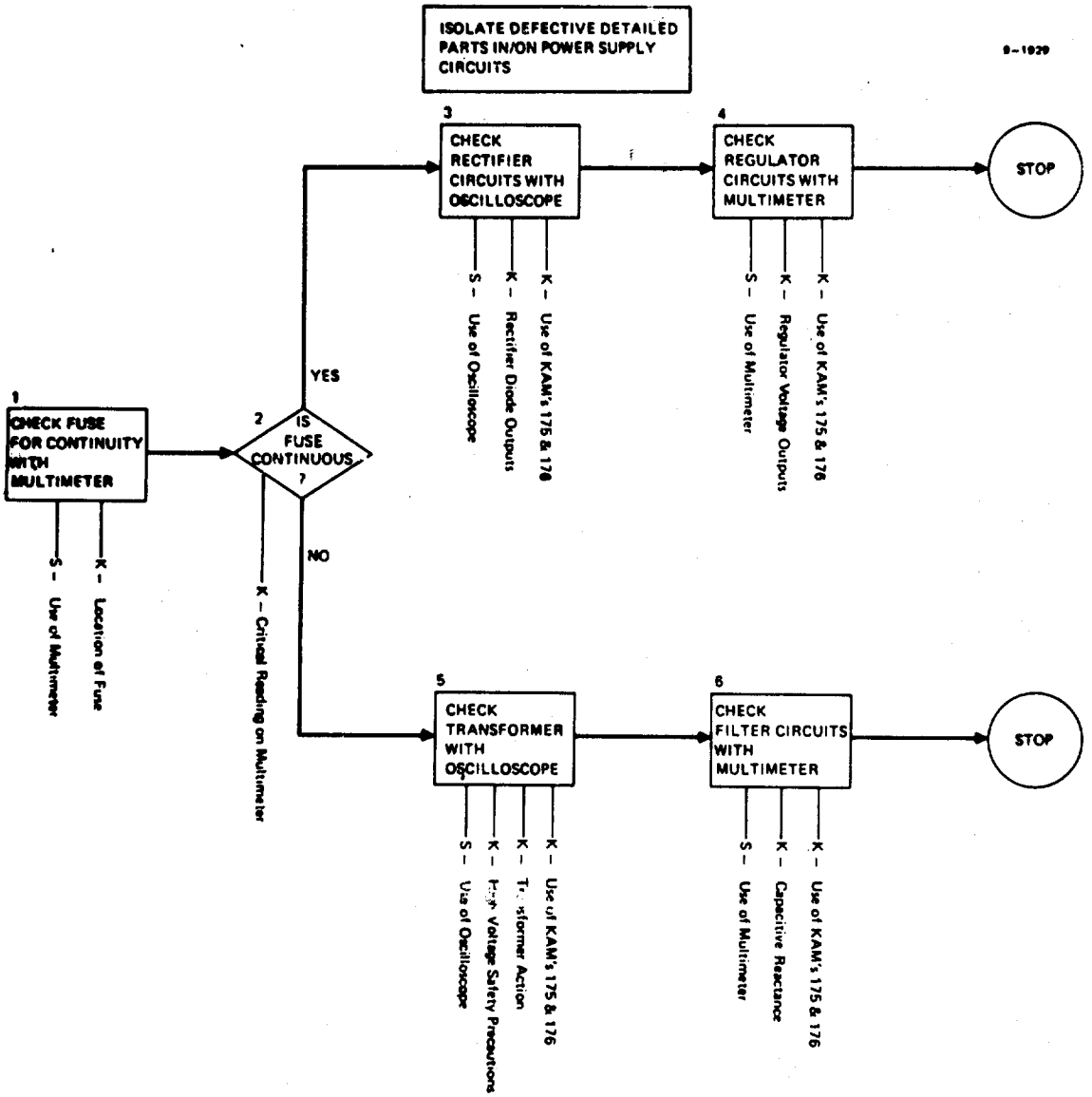

FIGURE C-6 TASK DIAGRAM (VARIABLE SEQUENCE, EQUIPMENT ORIENTED TASK)

TASK ANALYSIS DOCUMENTATION FORM

9-1928

STS/CTS TASK STATEMENT: Isolate defective detailed parts in/on power supply circuits

BEHAVIOR: Isolate defective detailed parts in/on power supply circuits

CONDITIONS: Given a multimeter, oscilloscope, and KAM's, 175 and 176

STANDARDS: Within 15 minutes each

REFERENCES: KAM's 175 & 176, AFRAM - 525, KAO - 81

COURSE NO: 3ABR30630
STS/CTS NO: 306X0 DATED: MAR. 1974
DUTY: Maintenance of Cryptographic Equipment
DATE: 5 Sept 1978 PAGE 1 OF 1
ANALYST: Doe
STS/CTS REF: 12b (4) PROF. CODE 1b

STEP NO.	STEP (SUBTASK/DECISION QUESTION)	DECISIONS YES	DECISIONS NO	GO TO STEP	SUPPORTING SKILLS AND KNOWLEDGES
1	Check fuse for continuity with multimeter			2	S – Use of multimeter K – location of fuse
2	Is fuse continuous?	3	5		K – critical reading on multimeter
3	Check rectifier circuits with oscilloscope			4	S – Use of oscilloscope K – Rectifier diode outputs K – Use of KAM's 175 & 176.
4	Check regulator circuits with multimeter			STOP	S – Use of multimeter K – Regulator voltage outputs K – Use of KAM's 175 & 176.
5	Check transformer with oscilloscope			6	S – Use of oscilloscope K – High voltage safety precautions K – Transformer action K – Use of KAM's 175 & 176
6	Check filter circuits with multimeter			STOP	S – Use of multimeter K – Capacitive reactance K – Use of KAM's 175 & 176

FIGURE C–7 COMPLETED TASK ANALYSIS DOCUMENT FORM (VARIABLE SEQUENCE, EQUIPMENT-ORIENTED TASK)

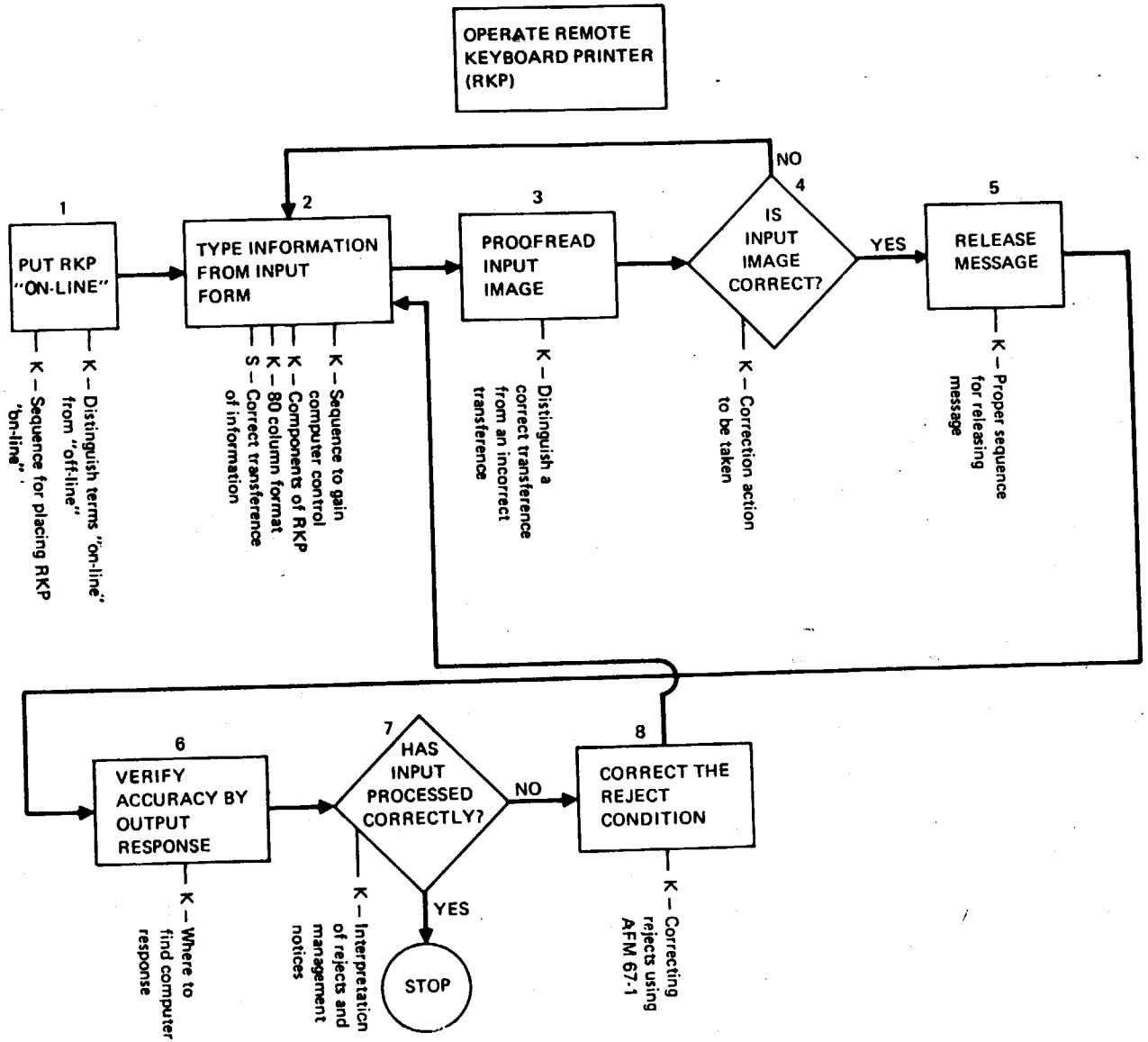

FIGURE C–8 TASK DIAGRAM (VARIABLE SEQUENCE, EQUIPMENT-ORIENTED TASK)

TASK ANALYSIS DOCUMENTATION FORM

9-1832

STS/CTS TASK STATEMENT: OPERATE REMOTE KEYBOARD PRINTER (RKP)

BEHAVIOR: OPERATE REMOTE KEYBOARD PRINTER

CONDITIONS: GIVEN REMOTE KEYBOARD PRINTER AND THREE COMPLETED INPUT FORMS

STANDARDS: CORRECTLY INPUT THE THREE COMPLETED INPUT FORMS WITH NO TIME LIMIT

REFERENCES: AFM 67-1

COURSE NO: 3ABR64530
STS/CTS NO: 645X0 DATED: _____
DUTY: GENERAL
DATE: 19 SEPT. 1978 PAGE 1 OF 1
ANALYST: JONES
STS/CTS REF: 24 g PROF. CODE 2b

STEP NO.	STEP (SUBTASK/DECISION QUESTION)	DECISIONS YES	DECISIONS NO	GO TO STEP	SUPPORTING SKILLS AND KNOWLEDGES
1	Put RKP "on-line"			2	K – Distinguish terms "on-line" from "off-line" K – Sequence for placing RKP "on-line"
2	Type information from input form			3	K – Sequence to gain computer control K – Components of RKP K – 80 column format (configuration) S – Correct transference of information
3	Proofread input image			4	K – Distinguish a correct transference from an incorrect one (visual interpretation)
4	Is input image correct?	5	2		K – Correction action to be taken
5	Release message			6	K – Proper sequence for releasing message
6	Verify accuracy by output			7	K – Where to find computer's response
7	Has input processed correctly?	STOP	8		K – Interpretation of rejects and management notices
8	Correct the reject condition			2	K – Correcting rejects using AFM 67-1

FIGURE C–9 COMPLETED TASK ANALYSIS DOCUMENTATION FORM (VARIABLE SEQUENCE, EQUIPMENT - ORIENTED TASK)